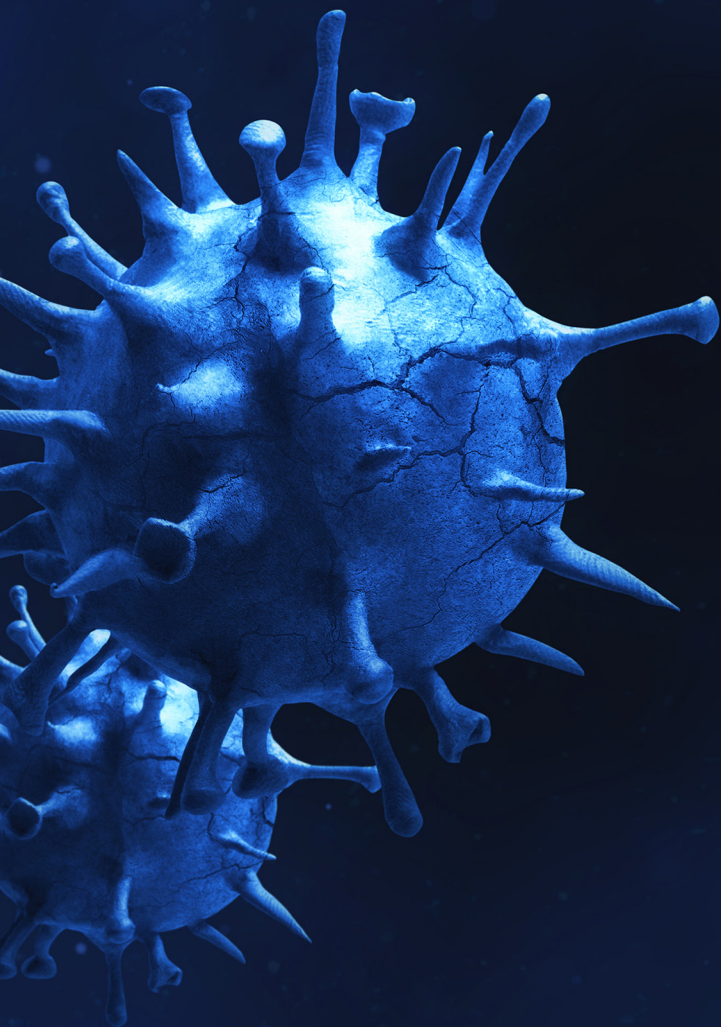




NATIONAL ACADEMY OF ENGINEERING®



Engineering for PANDEMICS

**Preparedness, Response,
and Recovery**

2020 ANNUAL MEETING

October 4-7, 2020

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



NATIONAL ACADEMY OF ENGINEERING®

2020 ANNUAL MEETING

October 4–7, 2020 • Washington, DC

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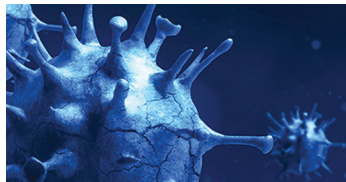
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*The National
Academies of*
**SCIENCES
ENGINEERING
MEDICINE**



Quick Reference Schedule



Sunday, October 4

10:00 – 11:00 am	Home Secretary's Meeting	LINK
	International Secretary's Meeting	LINK
12:00 – 2:00 pm	Public Program	LINK
3:00 – 3:30 pm	Awards Presentations	LINK
4:30 – 6:00 pm	Plenary Speakers	LINK
6:30 – 7:15 pm	Golden Bridge and Donor Recognition Society Virtual Event	

Monday, October 5

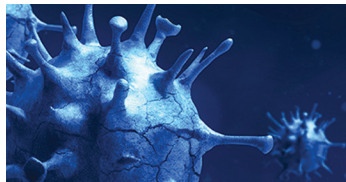
10:30 – 11:30 am	NAE Business Session	LINK
12:30 – 2:30 pm	FORUM: Engineering for Pandemics: Preparedness, Response, and Recovery	LINK
3:30 – 4:30 pm	Special Lecture: Racial Justice and Equity	LINK
5:00 – 6:00 pm	Leverage Your Charitable Giving Options Under Recent Stimulus Legislation	LINK

Tuesday, October 6

11:00 am – 6:00 pm	Section Meetings LINK	
11:00 am – 2:00 pm	Section Meeting 1	Section Meeting 2
	Section Meeting 3	Section Meeting 4
	Section Meeting 5	Section Meeting 6
3:00 – 6:00 pm	Section Meeting 7	Section Meeting 8
	Section Meeting 9	Section Meeting 10
	Section Meeting 11	Section Meeting 12

Wednesday, October 7

11:00 am – 12:00 pm	Yvonne C. Brill Lectureship in Aerospace Engineering	LINK
12:00 – 1:00 pm	Women's Meeting	LINK
2:00 – 3:00 pm	Testifying Before Congress	LINK



Sunday, October 4



10:00 am – 11:00 am

Home Secretary's Meeting

(by invitation only)

ZOOM LINK

International Secretary's Meeting

(for International Members & their guests)

ZOOM LINK

12:00 noon – 2:00 pm

Public Program

ZOOM LINK

Chair's Remarks



Donald Winter

Chair, National Academy of Engineering

Donald Winter is an independent consultant, and former Professor of Engineering Practice in the departments of Naval Architecture and Marine Engineering and Aerospace Engineering at the University of Michigan, where he taught graduate level courses on systems engineering, satellite design, and maritime policy. He served as the 74th Secretary of the Navy from January 2006 to March 2009. As Secretary of the Navy, he led America's Navy and Marine Corps Team and was responsible for an annual budget in excess of \$125 billion and almost 900,000 people. Dr. Winter currently serves as the chair of Australia's Naval Shipbuilding Advisory Board, providing advice to Ministers and the National Security Committee of Cabinet regarding their plans to reconstruct the Royal Australian Navy's fleet and establish a sustainable shipbuilding capability. He also is a Special Government Employee in the US Department of Defense where he serves as the Senior Defense Industry Advisor for Ukraine.

Dr. Winter's business career in the aerospace and defense industry spanned over 30 years as a systems engineer, program manager and corporate executive. From 2000 to 2005, he was President and CEO of TRW Systems (later Northrop Grumman Mission Systems), which he joined in 1972. In that position he oversaw operation of the business and its 18,000 employees, providing information technology systems and services; systems engineering and analysis; systems development and integration; scientific, engineering, and technical services; and enterprise management services. He also served on the company's corporate policy council. Previously, he served as vice president and deputy general manager for group development of TRW's Space and Electronics business; and vice president and general manager of the defense systems division of TRW. From 1980 to 1982, he was with the Defense Advanced Research Projects Agency (DARPA) as program manager for space acquisition, tracking, and pointing programs.

Dr. Winter was elected to the NAE in 2002 for pioneering contributions to high-powered laser technology and defense applications. He is a member of National Academies' Committee on Science, Engineering, Medicine and Public Policy, and the Intelligence Science and Technology Experts Group (ISTEG). He has served as a member of the NAE Committee on Membership, member and vice chair of the Special Fields and Interdisciplinary Engineering Peer Committee, and as peer committee vice chair of the Section 12 Executive Committee. Dr. Winter chaired the National Academies' Committee on the Analysis of Causes of the Deepwater Horizon Explosion, Fire, and Oil Spill to Identify Measures to Prevent Similar Accidents in the Future (B0119); and the Committee on Options for Implementing the Requirement of Best Available and Safest Technologies for Offshore Oil and Gas Operations.

He received his BS in physics from the University of Rochester in 1969, and his MS in 1970 and PhD in 1972, both in physics from University of Michigan. Dr. Winter is also a graduate of the University of Southern California Management Policy Institute, the UCLA Executive Program, and the Harvard University Program for Senior Executives in National and International Security.



12:00 noon – 2:00 pm **Public Program,** *continued*

President's Address



Dr. John L. Anderson

President, National Academy of Engineering

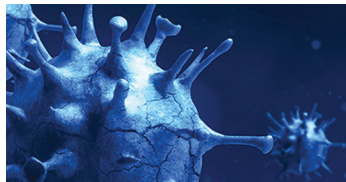
Vice Chair of the National Research Council

John L. Anderson is the president of the National Academy of Engineering since July 1, 2019. He was born in Wilmington, DE, and received his undergraduate degree from the University of Delaware in 1967 and a PhD degree from the University of Illinois at Urbana-Champaign in 1971, both in chemical engineering. He was most recently Distinguished Professor of Chemical Engineering and served as president (2007–2015) of the Illinois Institute of Technology (IIT). Before that he was provost and executive vice president at Case Western Reserve University (2004–2007), following 28 years at Carnegie Mellon University including 8 years as dean of the College of Engineering and 11 years as head of the chemical engineering department. He began his professional career as assistant professor of chemical engineering at Cornell University (1971–1976).

Dr. Anderson was elected to the NAE in 1992 for contributions to the understanding of colloidal hydrodynamics and membrane transport phenomena. He was elected an NAE councillor in 2015 and served on the Executive Compensation Committee and Temporary Nominating Committee on Member Diversity. He has also served on the Membership Policy Committee, Nominating Committee (chair), Chemical Engineering Section (chair, vice chair, section liaison, member), Chemical Engineering Peer Committee (chair), and Committee on Membership (immediate past chair, chair, vice chair, peer committee chair). His service also includes numerous National Academies activities, such as the Committee on Determining Basic Research Needs to Interrupt the Improvised Explosive Device Delivery Chain (chair); Committee on Review of Existing and Potential Standoff Explosives Detection Techniques (chair); Organizing Committee for the National Security and Homeland Defense Workshop (co-chair); Board on Chemical Sciences and Technology (co-chair); and Ford Foundation Minority Postdoctoral Review Panel on Physical Sciences, Mathematics, and Engineering.

In addition to his NAE membership, Dr. Anderson is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He was appointed to the National Science Board in 2014 for a six-year term. He received the Acrivos Professional Progress Award from the American Institute of Chemical Engineers (AIChE) and an award from the Pittsburgh Section of AIChE for “Outstanding Professional Accomplishments in the Field of Academics,” and he is listed on the Alumni Wall of Fame at the University of Delaware. In 2012 he received the National Engineering Award from the American Association of Engineering Societies. He has held visiting professorships at the Massachusetts Institute of Technology (fellow of the John Simon Guggenheim Foundation), University of Melbourne (Australia), and Landbouwwuniversiteit Wageningen (the Netherlands). He has presented guest lectures at universities throughout the United States and is the author of numerous journal articles and book chapters.

Dr. Anderson is married to Patricia Siemen Anderson. They have two children and five grandchildren.



Sunday, October 4



12:00 noon – 2:00 pm **Public Program,** *continued*

Introduction of the Class of 2020



Dr. Alton D. Romig, Jr.

Executive Officer, National Academy of Engineering

As executive officer, **Alton D. Romig, Jr.** is the chief operating officer responsible for the program, financial, and membership operations of the Academy, reporting to the NAE president. Under Congressional charter, the Academy provides advice to the federal government, when requested, on matters of engineering and technology.

He was previously vice president and general manager of Lockheed Martin Aeronautics Company Advanced Development Programs, better known as the Skunk Works®. He spent the majority of his career at Sandia National Laboratories, operated by the Lockheed Martin Corporation, having joined Sandia as a member of the technical staff in 1979 and moved through a succession of R&D management positions leading to his appointment as executive vice president in 2005. He served as deputy laboratories director and chief operating officer until 2010, when he transferred to the Skunk Works.

Dr. Romig serves or has served on a number of advisory committees including those at the University of Washington, MIT, Ohio State, Purdue, Georgia Tech, the Colorado School of Mines, and Sandia National Laboratories. He is also visiting associate of applied physics and materials science at Cal Tech. Dr. Romig is a member of the board of directors of Football Research, Inc., a non-profit entity created and supported by the National Football League to review engineering technology to improve the safety of the sport. From 2003 to 2008, he served on the board of AWE, Aldermaston, UK, and chaired the program committee.

Dr. Romig is a fellow TMS, IEEE, AIAA, and AAAS. He is also a fellow and honorary member of ASM International. He was elected to the National Academy of Engineering in 2003 and the Council of Foreign Relations in 2008. He was awarded the ASM Silver Medal for Materials Research in 1988.

Dr. Romig graduated from Lehigh University in 1975 with a BS in Materials Science and Engineering. He received his MS and PhD in Materials Science and Engineering from Lehigh University in 1977 and 1979, respectively.



3:00 – 3:30 pm

Awards Program

ZOOM LINK



Corale L. Brierley is principal and founder of Brierley Consultancy LLC (1991–present), which provides technical and business consultation to the mining and chemical industries and government agencies. Previously, she was chief of environmental process development for Newmont Mining Corporation (1990–91), general partner at VistaTech Partnership Ltd. (1988–99), president of Advanced Mineral Technologies, Inc. (1982–88), chemical microbiologist at the New Mexico Institute of Mining and Technology (1971–82), and microbiologist with Martin-Marietta Corp. (1968–69). Her interests are in biotechnology applied to mine production and market and business development in this technical area.

Dr. Brierley was elected to the NAE in 1999 for her innovations applying biotechnology to mine production and remediation. She served as NAE councillor (2009–14) and was elected vice president in 2014. She chaired the Audit Committee and the Earth Resources Engineering Section, and served on the Membership Policy Committee, Nominating Committee, Committee on Membership, Earth Resources Engineering Peer Committee, and Grainger Challenge Prize and Russ Prize Committees. She chaired the NRC Board on Earth Sciences and Resources, the congressionally mandated Committee on Coal Research, Technology and Resource Assessments to Inform Energy Policy; the Committee on Review of the US Geological Survey's Mineral Resources Program; and the Pre- and Postdoctoral Engineering Panels for the Ford Foundation Diversity Fellowships Program. Other Academies service includes the Committee on the Superfund Site Assessment and Remediation in the Coeur d'Alene River Basin; Panel on Technologies for the Mining Industries; and committees on Novel Approaches to the Management of Greenhouse Gas Emissions from Energy Systems, on Ground Water Recharge in Surface-Mined Areas, and on Research Programs of the US Bureau of Mines. In addition, she has served on two division review committees at Los Alamos National Laboratory, the International Advisory Committee for the Biohydrometallurgy Symposia (1983–2013), and the editorial boards for Elsevier's Hydrometallurgy journal since 1996 and Minerals Engineering since 2014.

Dr. Brierley is a member of the Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, and has received the AIME's James Douglas Gold Medal for distinguished achievement in nonferrous metallurgy (2008) and SME's Milton E. Wadsworth Award (2011), which recognizes distinguished contributions advancing understanding of the science and technology of nonferrous chemical metallurgy. She and her husband, James Brierley (NAE), jointly received in 2014 the American Mining Hall of Fame Medal of Merit Award for their scientific partnership with parallel achievements in academia and in business development. Dr. Brierley received the 2018 President's Medal from New Mexico Institute of Mining and Technology for representing her alma mater as a cutting-edge scientist, innovator, and leader.

She received a BS in biology (1968) and MS in chemistry (1971) from the New Mexico Institute of Mining and Technology, and a PhD in environmental sciences from the University of Texas at Dallas in 1982.



Awards Program, *continued*

2020 Simon Ramo Founders Award Recipient



Dr. Frances S. Ligler

Senior Scientist, Retired, Naval Research Laboratory

Distinguished Professor of Biomedical Engineering

Joint Department of Biomedical Engineering

North Carolina State University and UNC-Chapel Hill

The Simon Ramo Founders Award, the oldest award presented by the National Academy of Engineering, was established in 1965 to honor an outstanding NAE member or international member who has upheld the ideals and principles of the NAE through professional, educational, and personal achievement and accomplishment.

Frances S. Ligler, recipient of the 2020 Simon Ramo Founders Award, is being honored “for the invention and development of portable optical biosensors, service to the nation and profession, and educating the next, more diverse generation of engineers.”

Frances S. Ligler is the Lampe Distinguished Professor of Biomedical Engineering in the Joint Department of Biomedical Engineering in the College of Engineering at North Carolina State University and the School of Medicine at the University of North Carolina at Chapel Hill. Prior to joining the joint department in 2013, she was at the US Naval Research Laboratory for 28 years, serving from 1995 as senior scientist for Biosensors and Biomaterials. Earlier in her career, she was successively a principal scientist, project leader, and group leader for cellular immunology at DuPont. She has served on the board of trustees of Furman University and currently serves on the academic advisory board for Plaksha University in Mohali, Punjab, India.

Currently working in the fields of biosensors, microfluidics, tissue-on-chip, and regenerative medicine, she has also performed research in biochemistry, immunology, and proteomics. She has over 400 publications, including 35 US patents and four books, and has served on editorial boards for nine journals. She has mentored numerous university faculty and over 60 postdoctoral fellows, and copublished research with approximately 200 undergraduates.

Dr. Ligler is a member of the National Academy of Engineering (2005) and a fellow of SPIE, the American Institute for Medical and Biological Engineering, American Association for the Advancement of Science, and National Academy of Inventors. She has served on numerous NAE and National Academies committees, culminating in her service as an NAE councillor from 2014 to 2020.

In 2017 she was inducted into the National Inventors Hall of Fame (NIHF), which includes fewer than 600 inductees from the inventors of over 10.5 million U.S. patents, for her inventions seminal to portable optical biosensors. Her inventions have been commercialized to biosensor products used in food production plants, clinics in developing countries, pollution cleanup sites, and areas of concern for military and homeland security. She has served on the NIHF Inductee Selection Committee and is active in the NIHF Camp Invention Program for grades K–6.

Among many other awards, in 2003 Dr. Ligler was recognized by the Christopher Columbus Foundation with its Homeland Security Award (Biological, Radiological, Nuclear Field) and by President George W. Bush with the Presidential Rank of Distinguished Senior Professional. In 2012 she was honored with the Presidential Rank of Meritorious Senior Professional by President Obama. In 2017 the American Chemical Society selected her for its Award for Distinguished Service in the Advancement of Analytical Chemistry. In 2014 and 2018 she received honorary doctorates from the Agricultural University of Athens, Greece and Furman University, respectively.

She earned a BS in biology-chemistry from Furman University and both a DPhil (biochemistry) and a DSc (a higher doctorate for globally impactful contributions to biosensors) from Oxford University.



Awards Program, *continued*

2020 Arthur M. Bueche Award Recipient



Dr. Arden L. Bement, Jr.

*David A. Ross Distinguished Professor Emeritus
of Nuclear Engineering and
Director, Global Policy Research Institute and
Global Affairs Officer
Purdue University*

The Arthur M. Bueche Award of the National Academy of Engineering recognizes an engineer who has been actively involved in determining US science and technology policy, promoting technological developments, and contributing to the enhancement of relations between industries, government, and universities.

Arden L. Bement, Jr., recipient of the 2020 Arthur M. Bueche Award, is being honored “for contributions to science and technology advancement, international relationships, policy development, and Academies studies, from executive positions in government, industry, and academia.”

Dr. Bement is the David A. Ross Distinguished Professor Emeritus of Nuclear Engineering in the College of Engineering, Purdue University.

He began his academic career with adjunct professorships from the University of Washington and Oregon State University at the Hanford Graduate Center in Richland, Washington (1960–70). From 1970 to 1976 he was a professor of nuclear materials at MIT with joint appointments in the Departments of Nuclear Engineering and Materials Science and Engineering.

He began his tenure at Purdue University in 1993 as the Basil S. Turner Professor of Engineering with joint appointments in the Metallurgical Engineering and Electrical and Computer Engineering Departments. He was later head of the School of Nuclear Engineering (1998–2001) and chief global affairs officer (2010–12). He also held courtesy appointments in the School of Industrial Engineering and the Krannert School of Management.

During his academic career he directed three university-wide research programs: the Fusion Technology Research Program at MIT and, at Purdue University, the Midwest Consortium for High-Temperature Superconductivity (1993–98) and the Global Policy Research Institute (2010–12). He also served as a member of the board of visitors for the National Intelligence University (2012–18), a trustee of the Skolkovo Institute for Science and Technology in Moscow (2012–15), and member of the US-USSR Bilateral Exchange in Magneto-hydrodynamics (1973–75).

He held appointments under six presidents: director of the Office of Materials Science, DARPA (1976–80), deputy undersecretary of defense for research and advanced technology (1979–80), and director of the National Institute of Standards and Technology (2001–04) and National Science Foundation (2004–10).

He served in the US Army Corps of Engineers (1954–92) following his commissioning as a 2nd lieutenant at the Colorado School of Mines until his retirement as lieutenant colonel. He was a councilman and mayor pro tem for the city of Richland (1968–70). On behalf of the US State Department he served on the US National Commission for UNESCO as cochair of the Science and Technology Committee (2004–09), and he was a participant in US delegations to OAS science and technology meetings in Lima (2004), Mexico City (2008), and Panama City (2011); member of the USAID mission to Thailand (1983); head of the US delegation to the dedication of the King Abdullah University for Science and Technology, Saudi Arabia (2010); and US signatory for bilateral exchanges with Norway and France (2008–09). On behalf of the UN International Atomic Energy Agency he was technical advisor for both the National Research Council of Taiwan and the National Institute of Atomic Energy, Mexico (1970–75).



Awards Program, *continued*

In his industrial career Dr. Bement was a senior research fellow at the AEC Hanford Laboratories operated by General Electric Company (1954–65), manager of the Metallurgy Research Department and Fuels and Materials Department at the Pacific Northwest National Laboratory operated by the Battelle Memorial Institute (1965–70), and vice president for technical resources and chief science and technical officer for TRW (1980–93). He has also held board directorships at the Keithley Instrument Company (1984–97), the Lord Corporation (1987–2001), and Radian Research Inc. (since 2011).

For his achievements in government, industry, and academia, Dr. Bement has received several national and international honors and distinctions. He received the White House Distinguished Federal Executive Award (1980), the Department of Defense Distinguished Civilian Service Medal (1980), and the Department of Commerce William C. Redman Award (1995). He is a member of the National Academy of Engineering and the American Academy of Arts and Sciences, and a fellow of the American Association for the Advancement of Science. Over his 37 years of membership in the NAE, he has been active in a variety of capacities. He chaired the NRC Materials Advisory Board and the Commission for Engineering and Technical Studies (1986–92) and participated in 21 study committees, of which he chaired or cochaired eight and served as report review monitor for three.

He has received honorary doctorates from seven universities in the United States, Korea, and China. He was inducted as an honorary member of the graduate faculty at the Chinese Academy of Sciences (2008), awarded the Order of the Rising Sun with Gold and Silver Star by the emperor of Japan (2009), the Order of the Legion of Honor with rank of chevalier by the president of France (2011), and Chieftain of the Sagamores of the Wabash by the governor of Indiana (2012).

He holds an engineer of metallurgy degree from the Colorado School of Mines, and a master's degree from the University of Idaho and PhD from the University of Michigan, both in metallurgical engineering.

2020 J. C. Hunsaker Award in Aeronautical Engineering Recipient



Mr. Alan C. Brown

*Director of Engineering (retired)
Lockheed Corporation*

The J. C. Hunsaker Award in Aeronautical Engineering was established at the National Academy of Sciences in 1964 through a gift of common stock from Professor and Mrs. J. C. Hunsaker. The endowment fund was established to support a prize that recognizes distinguished contributions to aeronautical engineering. This year's award recipient will receive a cash prize of \$50,000.

Alan C. Brown, recipient of the 2020 J. C. Hunsaker Award in Aeronautical Engineering, is being honored "for innovative contributions to the design of commercial and military aircraft, and particularly leadership of the team that developed the F-117 Stealth Fighter."

Mr. Brown retired in 1992 as director of engineering at Lockheed Corporate Headquarters, where his two principal concerns were the promulgation of concurrent engineering and stealth technology throughout the corporation. He has given invited papers on both these subjects at national and international levels.

From 1975 to 1989 he was a member of the Lockheed Advanced Development Projects, colloquially known as the Skunk Works. He served first as deputy program manager for the Have Blue low observable research aircraft before becoming program manager and chief engineer for the F-117A Stealth Fighter from initial concept until the first production aircraft was built (1978–82). From 1982 to 1989 he was director of low observable technology.



Awards Program, *continued*

He joined Lockheed in 1960, starting in the physics laboratory of the Lockheed Missiles and Space Company in Palo Alto. He moved to the aircraft company in Burbank in 1966, working on propulsion installation on the supersonic transport and the FX and VSX aircraft (which later became the F-15 and S-3A, respectively). He was also engineering manager for the Lockheed group at Rolls-Royce on the L-1011 commercial transport program.

He began his aeronautical career with an engineering apprenticeship at Blackburn Aircraft in England (1945–50). After obtaining his second diploma (the equivalent of a master's) in 1952, he worked at Bristol Aeroplane Company as an aerodynamicist until he came to the United States in 1956. He was a research associate and lecturer at the University of Southern California and a research associate at Wiancko Engineering Company before joining Lockheed.

Since his retirement from Lockheed, Mr. Brown has taught short courses at Cranfield University (England), Linköping University (Sweden), Georgia Institute of Technology, and the US Naval Postgraduate School in Monterey, California. In addition, he was active in the University of California Mathematics, Engineering, and Science Achievement (MESA) program for middle and high schools (1994–2010), serving on the state committee and working particularly with Watsonville High School. Occasionally seen on Discovery and History channels in Stealth and Fighter documentaries.

Among his honors, Mr. Brown is a member of the US National Academy of Engineering and a fellow of the Royal Aeronautical Society and American Institute of Aeronautics and Astronautics. In 1990 he was selected for the AIAA Aircraft Design Award. And in 2001 he was recognized by his alma mater, Cranfield University, with an honorary doctor of science.

He has diplomas from Hull Technical College (1950) and the College of Aeronautics at Cranfield Institute of Technology (1952), and a master's degree from Stanford University (1969), all in aeronautical engineering.

4:30 pm – 6:00 pm

Plenary Speakers

[ZOOM LINK](#)

Introduction

Alton D. Romig, Jr

Executive Officer, National Academy of Engineering

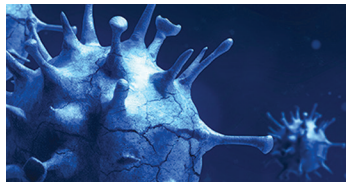


Lessons Learned: How to Prepare for Future Pandemics: David R. Walt (NAE)

*Hansjörg Wyss Professor of Biologically Inspired Engineering,
Harvard Medical School,
Professor of Pathology, Department of Pathology-Brigham and Women's Hospital
Core Faculty-Wyss Institute for Biinspired Engineering at Harvard University,
Co-Director, MGB Center for COVID Innovation, HHMI Professor*

David Walt is the Hansjörg Wyss Professor of Bioinspired Engineering at Harvard Medical School, professor of pathology at Harvard Medical School and Brigham and Women's Hospital, a Core Faculty Member of the Wyss Institute at Harvard University, a Howard Hughes Medical Institute Professor, and codirector of the Mass General Brigham Center for COVID Innovation. Previously, he was University Professor at Tufts University.

Dr. Walt's laboratory pioneered the development of microwell arrays, which revolutionized the field of genetic analysis, and introduced the idea of digital protein detection by developing a high-throughput technology for performing single molecule analysis. His research is aimed at applying new technologies to address unmet clinical diagnostics needs.



Sunday, October 4



4:30 – 6:00 pm

Awards Program, continued

Dr. Walt is the scientific founder of Illumina Inc. and Quanterix Corp., and has cofounded several other life sciences startups including Ultivue, Inc., Arbor Biotechnologies, Sherlock Biosciences, and Vizgen, Inc.

He has received numerous national and international awards and honors for his fundamental and applied work in the field of optical microwell arrays and single molecules. He is a member of the National Academy of Engineering and National Academy of Medicine; a fellow of the American Academy of Arts and Sciences, American Institute for Medical and Biological Engineering, American Association for the Advancement of Science, and National Academy of Inventors; and an inductee to the US National Inventors Hall of Fame.

He serves on the NASEM Standing Committee for Emerging Infectious Diseases and 21st Century Health Threats and the NASEM Board on Life Sciences. He was cochair of the NASEM Board on Chemical Sciences and Technology.

He has a BS in chemistry from the University of Michigan and a PhD in chemical biology from the State University of New York at Stony Brook.



Fighting COVID-19 With Resilience – A Race Against Time: Pam Chen

Executive Vice President, Global Operations & IT, AstraZeneca

Pam Cheng joined AstraZeneca in 2015 as executive vice president of Global Operations and Information Technology (IT), guiding the company's manufacturing, supply chain, procurement, and IT across 18 countries and leading a team of over 19,000. Under her leadership, AstraZeneca Global Operations has transformed significantly driving top performance across the business while delivering value back to the enterprise. The next phase of transformation includes the convergence of operational excellence and digital innovation, building the 'Factory of the Future'.

Before AstraZeneca she spent 18 years in global manufacturing, supply chain, and commercial roles at Merck/MSD. As president of MSD China, she was responsible for MSD's entire business in China—sales and marketing, commercial operations, and oversight of manufacturing and research and development. Prior to that, she was head of Global Supply Chain Management and Logistics for Merck and led the transformation of Merck supply chains across the global supply network. Before joining the Biopharmaceutical industry, she worked in engineering and project management roles at Universal Oil Products, Union Carbide Corporation, and GAF Chemicals.

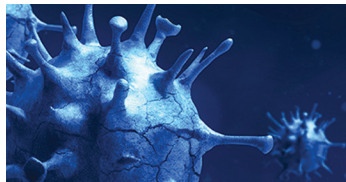
In addition to her executive role at AstraZeneca, Pam is a nonexecutive director for the board at Smiths Group plc.

Ms. Cheng holds bachelor's and master's degrees in chemical engineering from Stevens Institute of Technology and an MBA in marketing from Pace University.

6:30 – 7:15 pm

Golden Bridge and Donor Recognition Society Virtual Event

(by invitation only)



Monday, October 5



10:30 – 11:30 am

NAE Business Session

(members and international members only)

ZOOM LINK

12:30 pm – 2:30 pm

Forum: Engineering for Pandemics: Preparedness, Response, and Recovery

ZOOM LINK

Welcome

Dr. John L. Anderson

President, National Academy of Engineering

Panelists:

Lessons Learned: How to Prepare for Future Pandemics:

David R. Walt (NAE)

Hansjörg Wyss Professor of Biologically Inspired Engineering, Harvard Medical School

Fighting COVID-19 With Resilience – A Race Against Time:

Pam Cheng

Executive Vice President, Global Operations & IT, AstraZeneca

Keeping Society's Transportation Systems Operational:

Daniel Work

Associate Professor of Civil and Environmental Engineering, Vanderbilt University

The Future of Work: 15 Million New Jobs:

William B. Rouse (NAE)

Research Professor, McCourt School of Public Policy, Georgetown University

Vaccine Pandemic Production & Scale-Up:

Paul McKenzie (NAE)

Chief Operating Officer, CSL Behring

Charting Pathways Out of Poverty Before and During the Pandemic: Trends in acute multidimensional poverty across the developing world:

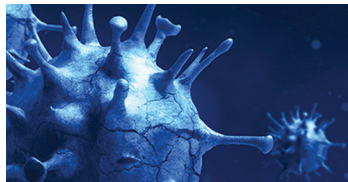
Sabina Alkire

Director, Oxford Poverty and Human Development Initiative (OPHI)

Moderator:

Deanne Bell

TV Host and Founder/CEO, Future Engineers



Monday, October 5



12:30 pm–2:30 pm

Forum, *continued*



David R. Walt

David Walt is the Hansjörg Wyss Professor of Bioinspired Engineering at Harvard Medical School, professor of pathology at Harvard Medical School and Brigham and Women's Hospital, a Core Faculty Member of the Wyss Institute at Harvard University, a Howard Hughes Medical Institute Professor, and codirector of the Mass General Brigham Center for COVID Innovation. Previously, he was University Professor at Tufts University.

Dr. Walt's laboratory pioneered the development of microwell arrays, which revolutionized the field of genetic analysis, and introduced the idea of digital protein detection by developing a high-throughput technology for performing single molecule analysis. His research is aimed at applying new technologies to address unmet clinical diagnostics needs.

Dr. Walt is the scientific founder of Illumina Inc. and Quanterix Corp., and has cofounded several other life sciences startups including Ultivue, Inc., Arbor Biotechnologies, Sherlock Biosciences, and Vizgen, Inc.

He has received numerous national and international awards and honors for his fundamental and applied work in the field of optical microwell arrays and single molecules. He is a member of the National Academy of Engineering and National Academy of Medicine; a fellow of the American Academy of Arts and Sciences, American Institute for Medical and Biological Engineering, American Association for the Advancement of Science, and National Academy of Inventors; and an inductee to the US National Inventors Hall of Fame.

He serves on the NASEM Standing Committee for Emerging Infectious Diseases and 21st Century Health Threats and the NASEM Board on Life Sciences. He was cochair of the NASEM Board on Chemical Sciences and Technology.

He has a BS in chemistry from the University of Michigan and a PhD in chemical biology from the State University of New York at Stony Brook.



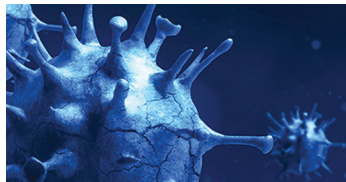
Pam Cheng

Pam Cheng joined AstraZeneca in 2015 as executive vice president of Global Operations and Information Technology (IT), guiding the company's manufacturing, supply chain, procurement, and IT across 18 countries and leading a team of over 19,000. Under her leadership, AstraZeneca Global Operations has transformed significantly driving top performance across the business while delivering value back to the enterprise. The next phase of transformation includes the convergence of operational excellence and digital innovation, building the 'Factory of the Future'.

Before AstraZeneca she spent 18 years in global manufacturing, supply chain, and commercial roles at Merck/MSD. As president of MSD China, she was responsible for MSD's entire business in China—sales and marketing, commercial operations, and oversight of manufacturing and research and development. Prior to that, she was head of Global Supply Chain Management and Logistics for Merck and led the transformation of Merck supply chains across the global supply network. Before joining the Biopharmaceutical industry, she worked in engineering and project management roles at Universal Oil Products, Union Carbide Corporation, and GAF Chemicals.

In addition to her executive role at AstraZeneca, Pam is a nonexecutive director for the board at Smiths Group plc.

Ms. Cheng holds bachelor's and master's degrees in chemical engineering from Stevens Institute of Technology and an MBA in marketing from Pace University.



Monday, October 5



12:30 pm–2:30 pm

Forum, *continued*



Daniel Work

Dan Work is an associate professor in civil and environmental engineering, electrical engineering and computer science, and the Institute for Software Integrated Systems at Vanderbilt University. He has held research appointments at the University of Illinois at Urbana-Champaign (2010–17), Institute for Pure and Applied Mathematics (2015, 2020), Microsoft Research Redmond (2009), and Nokia Research Center Palo Alto (2007–09).

Dr. Work pioneered methods for monitoring and controlling road traffic using vehicles, rather than fixed infrastructure, to sense and control road congestion. In 2015 his team was the first to experimentally demonstrate that “phantom” traffic jams, which seemingly occur without an obvious cause but are due to human driving behavior, can be eliminated via control of a small fraction of automated vehicles in the flow. In 2008, as a researcher at Nokia Research Center Palo Alto in collaboration with UC Berkeley and Caltrans, he designed the first GPS smartphone-based traffic estimation algorithm, which was prototyped in a 100-car experiment in California and commercialized through Nokia. He is a recognized transportation expert whose work has appeared in media outlets including ABC’s Good Morning America, Reuters, Wired, and MIT Technology Review.

Dr. Work received a 2018 Gilbreth Lectureship from the National Academy of Engineering and a 2014 CAREER Award from the National Science Foundation. He earned a BS from Ohio State in 2006, and an MS (2007) and PhD (2010) from UC Berkeley, all in civil and environmental engineering.



William B. Rouse

Bill Rouse is a research professor in the McCourt School of Public Policy and senior fellow in the office of the senior vice president for research, both at Georgetown University; professor emeritus and former chair of the School of Industrial and Systems Engineering at the Georgia Institute of Technology; and principal at Curis Meditor, a firm focused on the health of people, processes, organizations, and society.

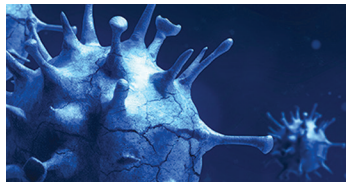
His research focuses on understanding and managing complex public-private systems such as healthcare delivery, higher education, transportation, and national security, with emphasis on mathematical and computational modeling of these systems for the purpose of policy design and analysis.

Dr. Rouse has written numerous articles, book chapters, and books, including most recently *Failure Management* (Oxford, 2020), *Computing Possible Futures* (Oxford, 2019), and *Universities as Complex Enterprises* (Wiley, 2016). He has also edited or coedited a number of books, including *Perspectives on Complex Global Challenges* (Wiley, 2016), *Engineering the System of Healthcare Delivery* (IOS Press, 2010), *The Economics of Human Systems Integration* (Wiley, 2010), *Enterprise Transformation: Understanding and Enabling Fundamental Change* (Wiley, 2006), and the best-selling *Handbook of Systems Engineering and Management* (Wiley, 1999, 2009).

Among many advisory roles, he has served as chair of the Committee on Human Factors (now Board on Human Systems Integration) of the National Academies, and as a member of the advisory committee for the Academies’ Division of Behavioral and Social Sciences and Education, US Air Force Scientific Advisory Board, and DoD Senior Advisory Group on Modeling and Simulation. He has been designated a lifetime national associate of the National Research Council and National Academies.

Dr. Rouse is a member of the National Academy of Engineering and a fellow of the Institute of Electrical and Electronics Engineers, International Council on Systems Engineering, Institute for Operations Research and Management Science, and Human Factors and Ergonomics Society.

He received his BS in mechanical engineering from the University of Rhode Island, and his SM and PhD, both in systems engineering, from the Massachusetts Institute of Technology.



Monday, October 5



12:30 pm–2:30 pm

Forum, *continued*



Paul F. McKenzie

Paul McKenzie is chief operating officer of CSL Limited, a global biotechnology company with a portfolio of life-saving medicines, including those that treat hemophilia and immune deficiencies, as well as vaccines to prevent influenza. He leads the company's global end-to-end operations organization and its accompanying strategy for achieving safety, quality, reliability, and innovation. He has responsibility for CSL Plasma and its network of more than 260 collection centers in the United States and Europe, as well as manufacturing, quality, engineering, environment, health and safety, business resiliency, business technology, supply chain, procurement, business services, and enterprise excellence. In July he took on additional responsibilities, including Seqirus, one of the world's largest influenza vaccine providers and a partner in pandemic preparedness.

Prior to joining CSL, Dr. McKenzie was executive vice president of Pharmaceutical Operations & Technology at Biogen, responsible for asset management, technical development, global manufacturing, supply chain operations, quality, and engineering. He also has held senior roles in R&D and manufacturing for Johnson & Johnson, Bristol-Myers Squibb, and Merck, earning a reputation as a patient-focused business leader.

Dr. McKenzie was elected to the NAE earlier this year. He has served on numerous professional and academic boards, including the board of trustees for the Illinois Institute of Technology and the Society for Biological Engineering.

He holds a BS from the University of Pennsylvania and a PhD from Carnegie Mellon University, both in chemical engineering.



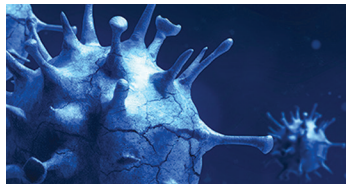
Sabina Alkire

Sabina Alkire directs the Oxford Poverty and Human Development Initiative (OPHI) and is associate professor of development studies in the Oxford Department of International Development at the University of Oxford. Her research interests include multidimensional poverty measurement and analysis, welfare economics, the capability approach, the measurement of freedoms, and human development.

Together with James Foster, she developed the Alkire-Foster (AF) method for measuring multidimensional poverty, a flexible technique to create measures tailored to each context. It has been implemented empirically to produce the Multidimensional Poverty Index (MPI), a tool to identify who is poor by considering the range of deprivations they suffer. The MPI is a headline figure of poverty that shows how people are poor nationally as well as by areas and groups, and by each indicator. It is always accompanied by a detailed information platform for policy design.

In 2015–16 Dr. Alkire was the Oliver T. Carr Professor of International Affairs and Professor of Economics at George Washington University. Previously, she worked at the Global Equity Initiative at Harvard University, the UN Commission on Human Security, and the World Bank's Poverty and Culture Learning and Research Initiative.

She holds a master's and doctorate in economics from the University of Oxford.



Deanne Bell

Deanne Bell is an engineer, television host, and entrepreneur. Her television hosting credits include PBS, ESPN, Discovery Channel, National Geographic, DIY Network, and most recently CNBC's Make Me a Millionaire Inventor. She is also the founder and CEO of Future Engineers, an education technology company that engages students in online contests and challenges. Future Engineers' inaugural competition, developed with the ASME Foundation and NASA, produced historic achievements including the first student-designed 3D print in space. Her company has since become a US Department of Education SBIR awardee, and was selected by NASA to host the Mars 2020 "Name the Rover" contest.

Previously she worked at Raytheon for three years as an optomechanical engineer. She focused on packaging FLIR into a helicopter-mounted gimbal, involving the redesign of the afocal telescope and the packaging of the cryo-cooled imager and CCD camera. She then worked for other R&D programs at the company, including as head of the mechanical design and build of a synthetic aperture ladar (SALT) optical test bench.

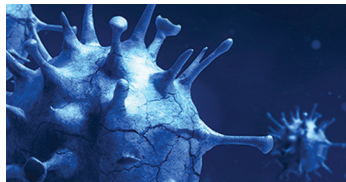
She earned her BS in mechanical engineering at Washington University in St. Louis and is the 2019 Young Alumni Award recipient for its McKelvey School of Engineering. She is also the featured interviewer in the fall 2019 issue of The Bridge.

2020 NAE Annual Meeting Program Committee

New this year, the annual meeting programmatic theme, Engineering for Pandemics: Preparedness, Response, and Recovery, was decided by a committee of NAE members from each section, keeping diversity in mind with respect to gender, ethnicity, work sector (business, academia, other), and tenure of membership. Their mission was to plan a meeting topic and identify speakers that would entice and inspire the members and other attendees during this annual gathering.

	Section Number	Election Year	
Alton D. Romig, Jr., Chair	1	2003	NAE (Lockheed Martin, retired)
Wesley L. Harris	1	1995	Massachusetts Institute of Technology
Gilda A. Barabino	2	2019	Olin College of Engineering
Lili Deligianni	3	2019	Columbia University (IBM, retired)
Sharon L. Wood	4	2013	The University of Texas at Austin
Vinton G. Cerf	5	1995	Google, LLC
David W. Roop	6	2018	DWR Associates, LLC (Dominion Energy Virginia, retired)
Andrea Goldsmith	7	2017	Princeton University
Kay M. Stanney	8	2019	Design Interactive, Inc.
David B. Spencer	9	2014	wTe Corporation
Jacqueline H. Chen	10	2018	Sandia National Laboratories
Franklin M. Orr, Jr.	11	2000	Stanford University
Dorota A. Grejner-Brzezinska	12	2019	The Ohio State University
Michaela Curran			NAE – Membership Director
Guru Madhavan			NAE – Program Director

Special thanks to the committee for accomplishing their mission!



Tuesday, October 6



3:30 pm – 4:30 pm

Special Lecture: Racial Justice and Equity

ZOOM LINK



John Brooks Slaughter is a professor of education and engineering in the Rossier School of Education and Viterbi School of Engineering at the University of Southern California (USC). A former director of the National Science Foundation, chancellor of the University of Maryland, College Park, and president of Occidental College, he has served for many years as a leader in the education, engineering, and scientific communities. He is well known for his commitment to increasing diversity in higher education, with a focus on the STEM disciplines.

Dr. Slaughter, a licensed professional engineer, began his career as an electronics engineer at General Dynamics and then worked for 15 years at the US Navy Electronics Laboratory in San Diego, where he became head of the Information Systems Technology Department. He has also been director of the Applied Physics Laboratory, professor of electrical engineering at the University of Washington, academic vice president and provost at Washington State University, the Irving R. Melbo Professor of Leadership in Education at USC, and president and CEO of the National Action Council for Minorities in Engineering.

He was appointed by President Jimmy Carter as assistant director and then director of the National Science Foundation and by President George W. Bush to membership on the President's Council of Advisors on Science and Technology. Among the boards of directors on which he has served are IBM, Northrop Grumman, Monsanto, Baltimore Gas and Electric Co., Sovran Bank, and Atlantic Richfield.

A member since 1982 of the National Academy of Engineering—for which he has served on the Committee on Minorities in Engineering, cochaired the Action Forum on Engineering Workforce Diversity, and served two terms on the NAE Council—he is also the recipient of its Arthur M. Bueche Award (2004). In addition, he is a fellow of the American Association for the Advancement of Science, Institute of Electrical and Electronics Engineers, and American Academy of Arts and Sciences; was elected to the Tau Beta Pi honorary engineering society; and was named Eminent Member of the Eta Kappa Nu honorary electrical engineering association. He is also a member of Phi Beta Kappa. In 1993 he was named to the American Society for Engineering Education Hall of Fame and received its Centennial Medal. In 1987 he was selected for the first US Black Engineer of the Year Award, and in 1997 received the Martin Luther King Jr. National Award. He received the UCLA Medal of Excellence in 1989, was elected to the Kansas State University Engineering Hall of Fame in 1990, and received the Roger Revelle Award from the University of California, San Diego in 1991. Dr. Slaughter earned his PhD in engineering science from UCSD, MS in engineering from the University of California, Los Angeles, and BS in electrical engineering from Kansas State University. He holds honorary degrees from 31 colleges and universities.

5:00 pm – 6:00 pm

Leverage Your Charitable Giving Options Under Recent Stimulus Legislation

ZOOM LINK

(advance registration required)



Led by Elana Lipa

Director of Planned Giving NASEM

Learn about the latest charitable giving strategies that may be beneficial to you based on the CARES Act and other applicable legislation. This seminar will provide attendees with case studies for structuring gifts that both leverage the financial benefits included in the legislation as well as demonstrate strategic, long term philanthropic plans to benefit the NAE's work to advance the engineering profession and solve large-scale problems. If you would like to submit questions prior to the seminar, please email them to Tocco Barkley at tbarkley@nas.edu.



SECTION MEETINGS

The National Academy of Engineering is organized in twelve sections representing broad engineering categories. These are the annual business meetings for each section. The section chairs are listed below.

11:00 am – 2:00 pm

1 – Aerospace

Lester L. Lyles (1)
Independent Consultant
(2021)

ZOOM LINK



2 – Bioengineering

David J. Mooney (2, 3)
Robert P. Pinkas Family Professor
of Bioengineering
Harvard University
(2021)

ZOOM LINK



3 – Chemical

Juan J. dePablo (3)
Liew Family Professor in Molecular
Engineering
The University of Chicago
(2021)

ZOOM LINK



4 – Civil and Environmental

Henry G. Schwartz (4)
Independent Consultant
(2021)

ZOOM LINK



5 – Computer Science

Julia Hirschberg (5)
Percy K. and Vida L. W. Hudson
Professor of Computer Science
Columbia University
(2021)

ZOOM LINK



6 – Electric Power/Energy Systems

Mark G. Adamiak (6, 7)
Chief Application Architect (Retired)
Grid Automation (Protection, Control,
and SCADA) GE Power
(2021)

ZOOM LINK



3:00 – 6:00 pm

7 – Electronics, Communication and Information Systems

James S. Harris (7, 9)
James and Ellenor Chesebrough Professor
Stanford University
(2021)

ZOOM LINK



8 – Industrial, Manufacturing and Operational Systems

Gerald G. Brown (8)
Emeritus Distinguished Professor
of Operations Research
U.S. Naval Postgraduate School
(2022)

ZOOM LINK



9 – Materials

Steven J. Zinkle (9, 6)
Governor's Chair Professor
The University of Tennessee, Knoxville
(2021)

ZOOM LINK



10 – Mechanical

Nadine Aubry (10, 1)
Provost and Senior Vice President
Tufts University
(2022)

ZOOM LINK



11 – Earth Resources

Mark G. Adamiak (6, 7)
Chief Application Architect (Retired)
Grid Automation (Protection, Control,
and SCADA) GE Power
(2021)

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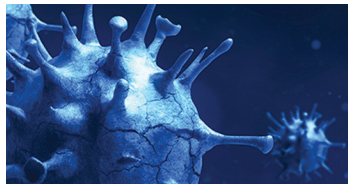


12 – Special Fields and Interdisciplinary

George T. Ligler (12)
Proprietor
GTL Associates
(2021)

ZOOM LINK





Wednesday, October 7



11:00 am – 12:00 pm

Yvonne C. Brill Lectureship in Aerospace Engineering

[ZOOM LINK](#)



From Airbags to Wheels: The Evolution of GN&C for Entry, Decent, and Landing

A. Miguel San Martín

Miguel San Martín was born in northern Patagonia, Argentina, and grew up in Buenos Aires. Inspired by the Apollo and Viking missions, he came to the United States to attend university and fulfill his dream of contributing to space exploration by working for NASA.

His first job was at the Jet Propulsion Laboratory (JPL), where he is now chief engineer for the Guidance and Control Section and provides support and consultation for current and future science missions. Early in his career, he participated in the *Cassini* mission to Saturn. He was later named chief engineer for the Guidance, Navigation, and Control (GN&C) system for the *Pathfinder* mission, which in 1997 landed *Sojourner*, the first robotic vehicle to land on Mars. He assumed the same role for the highly successful mission that landed the robotic vehicles *Spirit* and *Opportunity* on Mars in 2004. Subsequently, he was the GN&C chief engineer for the Mars Science Laboratory, which landed the one-ton rover *Curiosity* on the surface of Mars on August 5, 2012. He was a co-architect of *Curiosity's* innovative SkyCrane landing architecture and also served as its deputy phase lead for entry, descent, and landing.

For his contributions Mr. San Martín was awarded two NASA Exceptional Achievement in Engineering Medals, named JPL Fellow in 2013, and elected to the National Academy of Engineering in 2019.

He graduated summa cum laude from Syracuse University with a degree in electrical engineering and was named Engineering Student of the Year. He received his master's from the Massachusetts Institute of Technology in aeronautics and astronautics with a specialization in guidance, navigation, and control.

12:00 – 1:00 pm

Women's Meeting

[ZOOM LINK](#)

2:00 – 3:00 pm

Testifying Before Congress

[ZOOM LINK](#)

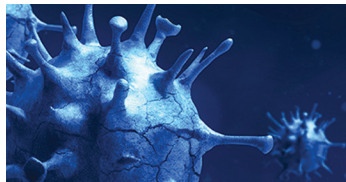


Mr. Christopher King

Executive Director, Office of Congressional and Government Affairs

It is essential that congressional policymakers hear a clear and objective interpretation of what science and technology bring to the policy agenda. This communication is a special type of oral presentation, and several elements are key to its success.

Christopher King is the executive director of the Academies' Office of Congressional and Government Affairs. He previously served as acting assistant secretary for Congressional Affairs, director of policy and analysis, and senior advisor at the US Department of Energy. Before joining DOE, Mr. King spent over a decade on Capitol Hill, including as a subcommittee staff director for the US House Science, Space, and Technology Committee.



2019 Honor Roll of Donors



We greatly appreciate the generosity of our donors. Your contributions enhance the impact of the National Academy of Engineering's work and support its vital role as advisor to the nation. The NAE acknowledges contributions made as personal gifts or as gifts facilitated by the donor through a donor-advised fund (DAF), matching gift program, or family foundation.

Lifetime Giving Societies

We gratefully acknowledge the following members and friends who have made generous charitable lifetime contributions. Their collective, private philanthropy enhances the impact of the academies as advisor to the nation on matters of science, engineering, and medicine. Recently, three new giving societies were introduced, recognizing donors at \$250,000 and above.

The Abraham Lincoln Society

In recognition of members and friends who have made lifetime contributions of \$1 Million or more to the National Academy of Sciences, National Academy of Engineering, or National Academy of Medicine. Boldfaced names are NAE members.

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James H. and Marilyn Simons
John and Janet Swanson
Anthony J. Yun and Kimberly A. Bazar

Listed below are individuals who became members of the Lincoln Society between January 1 and August 28, 2020:
Marci and **James J. Truchard**

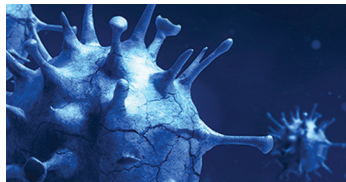
The Benjamin Franklin Society

In recognition of members and friends who have made lifetime contributions of \$500,000 to \$999,999 to the National Academy of Sciences, National Academy of Engineering, or National Academy of Medicine. Boldfaced names are NAE members.

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Anonymous (1)



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Charles M.* and Rebecca M. **Vest**

Wm. A. Wulf

Anonymous (1)

Listed below are individuals who became members of the Curie Society between January 1 and August 28, 2020:

John and Pat **Anderson**

The Einstein Society

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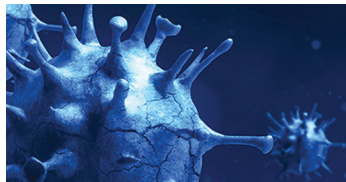
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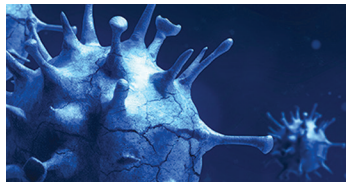
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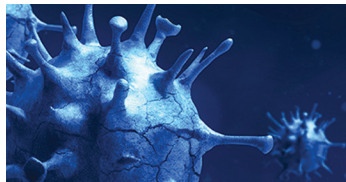
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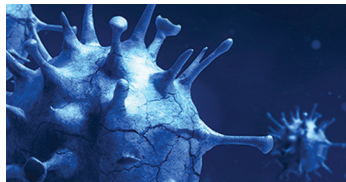
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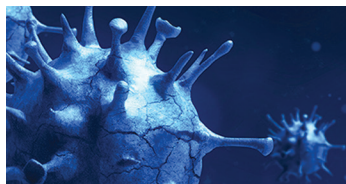
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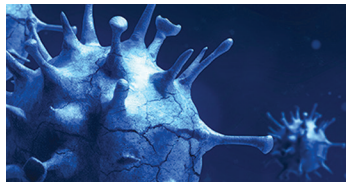
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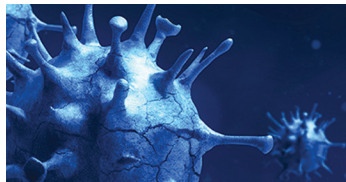


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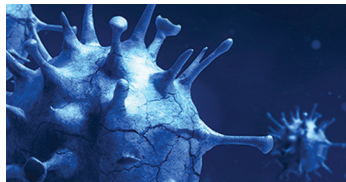
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